21. The projection television of claim 2, wherein said lenses have preselected wavelength dependent light reflecting characteristics suitable for preconditioning said images so as to compensate for less than all of said chromatic aberrations induced in said images by said projection screen.

22. The projection television of claim 2, wherein more of said chromatic aberrations induced by said screen are corrected by said reflector than by said lenses, whereby said lenses can be less expensive than lenses capable of correcting substantially all of said chromatic aberrations induced by said screen.

REMARKS

Applicants have amended claims 1-4, 11 and 13, and have added new claims 21-22. Claim 11 has been placed in dependent form. In view of the amendment to claim 11, claims 12 and 14-20 were deemed redundant and canceled, without prejudice. The total number of claims and the number of independent claims have each been reduced. Accordingly, no additional filing fee is required for adding claims 21-22.

Claims 1-8, 10-18 and 20 were rejected under 35 USC 103 by reason of US 5,796,499 - Wenyon in view of JP 8-292498 - Takano. The Examiner asserts that Wenyon discloses every feature of claims 1 and 11 except for the holographic reflector, but that Tanako teaches a conventional holographic reflector. The Examiner concludes that,

> Therefore, it would have been considered quite obvious to a person of ordinary skill in the relevant art employing a projection TV as taught by Wenyon to modify the reflector to be holographic such as Takano's holographic reflector in order to correct optical defects such as chromatic aberrations induced by the projection screen, and also to reduce the depth of the projection TV.

Although Takano clearly discloses a holographic reflector in a projection TV, a close examination of Tanako reveals that the Examiner's conclusion as to what would be obvious to one skilled in the art from Tanako is fundamentally flawed.

Tanako actually seems to address two problems. One problem is reducing the depth of the projection TV housing. At page 5 of the translation, beginning at line 6, Tanako states,

> The hologram 1 is a hologram of the reflection type, capable of reflecting the incident light in the direction of non-regular reflection. Even if same may be arranged in a stand-up angle as shown in the drawing, it becomes possible to apply the light almost perpendicularly to the screen 4. As a result of such application, it becomes possible to reduce the depth of the video display device by the stand-up portion of the hologram 1.

However, this solution causes another problem, described in the paragraph bridging pages 5-6, and the paragraph following, together with several proposed solutions,

> Since, even in the case of a hologram having no lens function, astigmatism is generated somewhat provide that the reflection is made irregular, the said projection lens may be given the function of correcting same. For such a purpose, a Tohrig surface, a cylindrical surface, etc may be used at a part of the projecting lens. Moreover, a lens having a corrective function may be used independently of the projection lens.
>
> In addition, a second hologram may be used as a projection means in addition to the said projection lens. In such a case, it becomes possible to cancel the color aberration of the hologram which is essential to this invention.

In summary, Tanako's use of the holographic reflector reduces cabinet depth but the holographic reflector induces astigmatism and chromatic aberrations in the projected images on the screen. The solutions include fixing the problem with the projection lenses, fixing the problem with an additional lens or fixing the problem with another hologram. Each of

these solutions increases cost, by making the projection lenses more complex, by adding expensive corrective lenses or by adding one or more holograms (see page 6, paragraph 0011).

Moreover, not one of these solutions is directed to solving the problem of chromatic aberration in a transmissive three-dimensional holographic projection screen.

The situation is significantly different in applicants' application of holographic technology in projection TVs. As described in the specification, for example beginning at page 12, line 24,

> The panchromatic holographic reflector comprises preselected, wavelength dependent light reflecting characteristics suitable for preconditioning the images as a function of light wavelength, so as to compensate for chromatic aberrations induced in the images by the projection screen.

A first distinction is that applicants' holographic reflector is configured to correct chromatic aberrations in the screen.

A further advantage from use of the holographic reflector to correct chromatic aberrations induced by the screen is described at page 14, lines 12-15 and page 15, lines 13-18,

> According to an inventive aspect, the optical correction applied to the images between the projection tubes and the screen is distributed between the glass lenses 15, 17 and 19 and the mirror 20, which can be curved to provide optical correction.
>
> . . . . .
>
> Whereas part of the optical power is contributed by the holographic mirror, fewer demands are placed on lenses 15, 17 and 19, which can comprise relatively inexpensive polymer lenses. According to a further inventive aspect, lenses 15, 17 and 19 can be eliminated completely and their function met entirely by the holographic reflector (mirror 20). In that case, the image projectors have exit pupils that do not magnify or focus the images at all

A second distinction is that applicants' holographic reflector makes it possible to use simpler and less expensive projection lenses, even polymer plastic lenses. One skilled in the art would recognize that the use of polymer plastic lenses in a projection TV is as counterintuitive as can be imagined.

A third distinction is that the projection lenses can be eliminated altogether, with out the need to add more precision lenses or yet another hologram.

All in all, Tanako's teachings that astigmatic and chromatic aberrations in a reflector can be fixed with more expensive projection lenses, additional corrective lenses or additional holograms not only teaches away from applicants' invention, but fails to even recognize the problem of chromatic aberrations in transmissive three-dimensional holographic screens. Tanako supplies no solutions that reduce cost, a critical factor in marketing all kinds of televisions, and projection televisions in particular.

Applicants have amended the claims to emphasize the distinctions noted above.

Claim 1 has been rearranged to recite the screen and the screen characteristics in the second clause, further reciting that,

> said projection screen nevertheless tending to induce chromatic aberrations in said images projected on said screen.

Claim 1 further describes the holographic reflector as,

> said holographic reflector providing correction of at least some of said chromatic aberrations induced by said projection screen.

Neither of these features is disclosed or suggested by the combination of Wenyon and Tanako. No structure in the cited

combination corrects chromatic aberrations in a transmissive holographic screen using a holographic reflector.

Claim 2 has been amended to recite that the lenses,

> correct less than all of said chromatic aberrations induced by said projection screen.

This feature is neither disclosed nor suggested by the combination of Wenyon and Tanako. Tanako in particular teaches that the projection lenses must correct more aberrations, rather than less. Moreover, Tanako fixes aberrations in a reflector, not in a screen.

Claim 3 is now directed to the lens-free embodiment, reciting that,

> said image projectors comprise exit pupils substantially incapable of magnifying, focusing and correcting said chromatic aberrations induced by said projection screen.

Tanako has a lens-free embodiment, but requires another hologram or set of holograms in its place. The combination neither teaches nor suggests a projection TV having only a screen, a reflector and projectors without lens, that is, without substituting additional structure for the missing lenses.

Claim 4 now depends from claim 3 and has been amended to recite that,

> said holographic reflector provides correction of substantially all of said chromatic aberrations induced by said projection screen when said image projectors comprise said exit pupils substantially incapable of magnifying, focusing and correcting said chromatic aberrations induced by said projection screen

Tanako's reflector, alone and in combination with Wenyon, is the cause of optical aberrations, rather than the solution to optical aberrations induced by a screen.

Formerly independent claim 11 has been amended to depend from claim 1 and now recites more specifically that,

> said holographic reflector has preselected wavelength dependent light reflecting characteristics suitable for preconditioning said images so as to compensate for said chromatic aberrations induced in said images by said projection screen

The reflector of Tanako causes aberrations that need to be fixed by other means, Tanako's reflector does not correct aberrations induced by the screen.

New claim 21 depends from claim 2 and more specifically defines the characteristics of the lenses, reciting,

> 21. The projection television of claim 2, wherein said lenses have preselected wavelength dependent light reflecting characteristics suitable for preconditioning said images so as to compensate for less than all of said chromatic aberrations induced in said images by said projection screen.

The correction provided by the lenses is keyed to correcting less than all aberrations induced by the screen, specifically distinguishing over each of Wenyon and Tanako, as well as their combination.

New claim 22 depends from claim 2 and more specifically defines the respective corrective capabilities of the reflector and the lenses to correct aberration induced by the screen, reciting,

> 22. The projection television of claim 2, wherein more of said chromatic aberrations induced by said screen are corrected by said reflector than by said lenses, whereby said lenses can be less expensive than lenses capable of correcting substantially all of said chromatic aberrations induced by said screen.

Claim 22 thus recites structure supporting the advantage in the whereby clause that the lenses can be less expensive than otherwise understood by those skilled in the art to be required for projection televisions. Tanako teaches more

complex and thus more expensive lenses, or additional lenses or additional holograms.

In view of the amendment to claim 3, claim 13 has been amended to depend from claim 1.

In view of the amendment to claim 11, claims 12 and 14-20 were deemed redundant and have been canceled without prejudice.

Applicants have made every effort to amend and distinguish the claims over the prior art of record. It is believed that all claims are in condition for allowance, and prompt allowance is hereby respectfully requested.

Respectfully submitted,

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Harvey D. Fried
Reg. No. 28,298
(609) 734-6811

Patent Operations,
Thomson multimedia Licensing, Inc.
Two Independence Way, Suite #2
Princeton, NJ 08540

Changes to Specification:

At page 9, lines 10-14,

These results are achieved by forsaking the extruded lens screen technology altogether. Instead, [α] a projection television receiver in accordance with an inventive arrangement has a screen formed by a three dimensional hologram formed on a substrate, for example, a polyethylene film, such as Mylar®.

Changes to Claims:

1. (Twice Amended) A projection television, comprising:

an optical system comprising at least three image projectors for projecting respective images of different colors [onto];

a projection screen[,] formed by a three dimensional hologram representing a three dimensional diffraction array [on a substrate], said screen receiving said images from said projectors on a first side and displaying said images on a second side with controlled light dispersion of all said displayed images, said projection screen nevertheless tending to induce chromatic aberrations in said images projected on said screen; and,

a holographic reflector disposed in optical communication with said image projectors and said screen so that one of said projectors has a first optical path in a substantially orthogonal orientation with said screen and at least two of said projectors have respective optical paths converging toward said first optical path in a non orthogonal orientation defining angles of incidence, said holographic reflector providing correction of at least some of said chromatic aberrations induced by said projection screen[; and,

said projection screen comprising a three dimensional hologram representing a three dimensional diffraction array on a substrate, said screen receiving images from said projectors on a first side and displaying said images on a second side with controlled light dispersion of all said displayed images].

2. (Twice Amended) The projection television of claim 1, wherein said at least three projectors each include a lens adapted to focus said respective images and to correct less than all of said chromatic aberrations induced by said projection screen.

3. (Twice Amended) The projection television of claim 1, [2] wherein said [lenses comprise a polymer material] said image projectors comprise exit pupils substantially incapable of magnifying, focusing and correcting said chromatic aberrations induced by said projection screen.

4. (Twice Amended) The projection television of claim 3, [1] wherein said holographic reflector provides correction of substantially all of said chromatic aberrations induced by said projection screen when said image projectors comprise said exit pupils [at least substantially lacking magnification and focusing properties] substantially incapable of magnifying, focusing and correcting said chromatic aberrations induced by said projection screen.

11. (Twice Amended) The [A] projection television of claim 1, wherein [comprising:

an optical system comprising at least three image projectors for projecting respective images of different colors onto a projection screen, and a holographic reflector disposed in optical communication with said image projector

and said screen so that one of said projectors has a first optical path in a substantially orthogonal orientation with said screen and at least two of said projectors having respective optical paths converging toward said first optical path in a non orthogonal orientation defining angles of incidence,] said holographic reflector has [comprising] preselected wavelength dependent light reflecting characteristics suitable for preconditioning said images so as to compensate for said chromatic aberrations induced in said images by said projection screen[; and

said projection screen formed by a three dimensional hologram representing a three dimensional array of lenticular elements disposed on a substrate, said screen receiving images from said projectors on a first side and displaying said images on a second side with controlled light dispersion of all said displayed images].

Cancel claim 12, without prejudice.

13. (Twice Amended) The projection television of claim 1, [12] wherein said lenses comprise a polymer material.

Cancel claims 14-20, without prejudice.

Add the following:

-- 21. The projection television of claim 2, wherein said lenses have preselected wavelength dependent light reflecting characteristics suitable for preconditioning said images so as to compensate for less than all of said chromatic aberrations induced in said images by said projection screen.

22. The projection television of claim 2, wherein more of said chromatic aberrations induced by said screen are

corrected by said reflector than by said lenses, whereby said lenses can be less expensive than lenses capable of correcting substantially all of said chromatic aberrations induced by said screen. --